

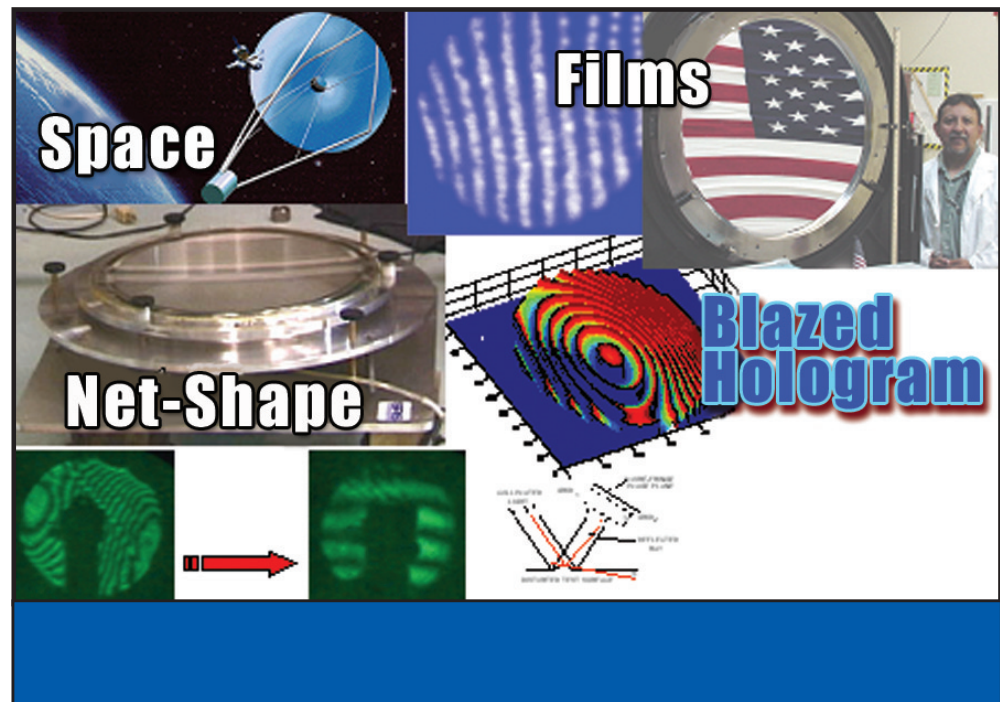


Air Force Research Laboratory | AFRL

Science and Technology for Tomorrow's Aerospace Forces

Success Story

LARGE MEMBRANE OPTICS AND COMPENSATION PROGRAM



The Large Membrane Optics and Compensation program encompasses enabling technologies critical to the development of ultra lightweight, large aperture, and space-based optical systems. Several Air Force missions, such as beam projection, surveillance, remote sensing, communications, and imaging, require very large optical apertures in space. The ability to perform all these missions will provide affordable “virtual global presence” by earth observations and force enhancement for the warfighter on demand. The ability to reduce the launch weights and compact packaging of the optical system in smaller launch vehicles will drastically reduce future costs.



Air Force Research Laboratory
Wright-Patterson AFB OH

Accomplishment

The Directed Energy Directorate built and tested a one-meter-class optical membrane mirror in the laboratory. Directorate engineers accomplished theoretical work, finite element modeling, and experimental work for the in-house laboratory membrane mirror experiment.

The engineers used liquid crystal-based optically addressed spatial light modulators (OASLMs) for wavefront correction of up to 200 waves of optical aberrations. The directorate initiated investigations of beam projection and relay mirror applications using OASLM. The directorate established international, domestic, and academic technical relationships for this project. A new experiment called “Fully Adaptable Telescope Experiment” will exercise the fusion of the membrane mirror and the OASLM technology.

Background

The directorate is investigating membrane mirrors for their lightweight, deployable, compact packaging and optical characteristics. The approach is to develop a new revolutionary telescope mirror technology using the stress-coated, net-shape, membrane mirror concept.

These membrane mirrors will form the large apertures in space-based optical systems. However, a membrane mirror coupled to a deployable, lightweight structure will not meet the precise tolerances needed by optical systems. Active control of the optical aberrations will be necessary to obtain the precise optical tolerances. The directorate plans to incorporate real-time holographic optical compensation methods.

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTT, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (01-DE-06)